

Amendments to the Claims

This listing of claims replaces all prior versions, and listings, of claims in the application.

Listing of Claims

1-41. (Canceled)

~~Claim 42.~~ (Currently amended)[[:]] A process for the production of ~~a polymer layer~~ of a flexible unbonded offshore pipe having a polymer layer with a thickness of at least about 4 mm, said process comprising ~~the steps of~~ shaping said polymer layer from a polymer material by extrusion in an extrusion station and cross-linking said extruded polymer material, said polymer material ~~comprising~~ including a polyethylene and a peroxide for providing a the cross-linking of the polymer material, said peroxide having an activation temperature substantially above ~~the~~ a temperature of the polymer material during the extrusion thereof, said cross-linking of said extruded polymer material being carried out by exposing the extruded polymer material to electromagnetic waves[[,]] selected from the group consisting of infrared radiation and microwave radiation.

~~Claim 43.~~ (Currently amended)[[:]] A The process according to claim 42, wherein said peroxide ~~having~~ has an activation temperature at least 10°C above the temperature of the polymer material during the extrusion thereof.

~~Claim~~ 44_. (Currently amended)[[:]] A The process according to claim 42, wherein said polymer material ~~being~~ is shaped by extrusion onto a supporting unit in the extrusion station.

~~Claim~~ 45_. (Currently amended)[[:]] A The process according to claim 42, wherein said polymer material ~~being~~ is shaped by extrusion into a supporting unit in the extrusion station.

~~Claim~~ 46_. (Currently amended)[[:]] A The process according to claim 42, wherein said extruded polymer material is exposed to electromagnetic waves for a sufficient time to thereby raise the temperature of the extruded polymer material at least to the activation temperature of the peroxide.

~~Claim~~ 47_. (Currently amended)[[:]] A The process according to claim 42, wherein the extrusion and cross-linking ~~steps~~ are carried out in an in-line process, including passing the extruded polymer material from the extruder through a cross-linking zone to activate said peroxide to thereby cross-link the polymer material, and wherein said activation is performed by applying electromagnetic waves in the cross-linking zone.

~~Claim~~ 48_. (Currently amended)[[:]] A The process according to claim 42, wherein the extrusion and cross-linking ~~steps~~ are

carried out in an in-line process, including passing the extruded polymer material from the extruder through a cross-linking zone to activate said peroxide to thereby cross-link the polymer material, and wherein said activation is performed by applying electromagnetic waves in the cross-linking zone, said polymer material being passed from the extruder to the cross-linking zone with less than 10°C average intermediate cooling.

~~Claim~~ 49. (Currently amended)[[:]] A The process according to claim 42, wherein said polymer material ~~being~~ is shaped by extrusion onto a supporting unit in the extrusion station, and wherein the supporting unit is a reinforcement layer of the flexible unbonded offshore pipe.

~~Claim~~ 50. (Currently amended)[[:]] A The process according to claim 42, wherein said polymer material ~~being~~ is shaped by extrusion onto a supporting unit in the extrusion station, and wherein the supporting unit is in the form of a carcass, said polymer layer being an inner liner of the flexible unbonded offshore pipe and said polymer material being extruded onto the carcass.

Claim 51 (Withdrawn): A process according to claim 42, wherein the supporting unit is in the form of a pressure armour, said polymer layer being an intermediate layer of the flexible

unbonded offshore pipe and said polymer material being extruded onto the pressure armour.

Claim 52 (Withdrawn): A process according to claim 42, wherein the supporting unit is in the form of a tensile armour, said polymer material being extruded onto the tensile armour.

~~Claim 53.~~ (Currently amended)[[:]] A The process according to claim 42, wherein the polymer layer is an inner liner of the flexible unbonded offshore pipe.

Claim 54 (Withdrawn): A process according to claim 53, wherein said inner liner being extruded into a supporting unit, said supporting unit being in the form of a calibrating device which calibrates the outer dimension of the pipe using vacuum onto a supporting surface.

~~Claim 55.~~ (Currently amended)[[:]] A The process according to claim 42, wherein the polyethylene has a density of at least 920 g/cm³.

~~Claim 56.~~ (Currently amended)[[:]] A The process according to claim 42, wherein the polyethylene has a density of at least 940 g/cm³.

~~Claim~~ 57_. (Currently amended)[[:]] A The process according to claim 42, wherein the polyethylene has a density of at least 945 g/cm³.

~~Claim~~ 58_. (Currently amended)[[:]] A The process according to claim 42, wherein the polyethylene has a density of at least 955 g/cm³.

~~Claim~~ 59_. (Currently amended)[[:]] A The process according to claim 42, wherein the polymer material ~~comprises~~ includes at least 50% by weight of polyethylene.

~~Claim~~ 60_. (Currently amended)[[:]] A The process according to claim 42, wherein the polymer material ~~comprises~~ includes at least 85% by weight of polyethylene.

~~Claim~~ 61_. (Currently amended)[[:]] A The process according to claim 42, wherein the polymer material ~~comprises~~ includes up to about 10% by weight of fillers.

~~Claim~~ 62_. (Currently amended)[[:]] A The process according to claim 61, wherein the fillers ~~being~~ are selected from the group consisting of pigments, heat stabilisers, process stabilisers, metal deactivators, flame retardants and reinforcement fillers.

~~Claim~~ 63_. (Currently amended)[[:]] A The process according to claim 42, wherein the polymer material ~~comprises~~ includes up to about 40% by weight of additional ~~polymer(s)~~ polymers other than polyethylene.

~~Claim~~ 64_. (Currently amended)[[:]] A The process according to claim 63, wherein said additional ~~polymer(s) being selected from the group consisting of~~ polymers are thermoplastics ~~preferably selected from the group consisting of thermoplastic elastomers; rubbers; polyolefins; liquid crystal polymers; polyesters; polyacrylates; polyethers; and polyurethane.~~

~~Claim~~ 65_. (Currently amended)[[:]] A The process according to claim 42, wherein the amount of peroxide in the polymer material is at least 0.1% by weight of the polymer material.

~~Claim~~ 66_. (Currently amended)[[:]] A The process according to claim 42, wherein the amount of peroxide in the polymer material is between 0.2% and 3% by weight of the polymer material.

~~Claim~~ 67_. (Currently amended)[[:]] A The process according to claim 42, wherein the polymer material ~~comprises~~ includes peroxide from 0.1% to 1.0% by weight.

~~Claim~~ 68_. (Currently amended)[[:]] A The process according to claim 42, wherein the polymer material ~~comprises~~ includes peroxide from 0.3% to 0.8% by weight.

~~Claim~~ 69_. (Currently amended)[[:]] A The process according to claim 42, wherein the peroxide has an activation temperature above 145°C[[:]].

~~Claim~~ 70_. (Currently amended)[[:]] A The process according to claim 69, wherein the peroxide ~~being~~ is selected from the group consisting of butylcumyl peroxide, dicumyl peroxide, Trigonox 145B, hydroperoxide, 2,5-dimethyl hexane 2,5-di-t-butyl peroxide, bis(t-butylperoxy isopropyl)benzene, t-butyl ~~cumyl~~ cumyl peroxide, di-t-butyl peroxide, 2,5-dimethyl hexane-3 2,5-di-t-butyl peroxide and butylhydroperoxide.

~~Claim~~ 71_. (Currently amended)[[:]] A The process according to claim 42, wherein the cross-linking is activated by exposing the extruded polymer to electromagnetic waves with a wavelength measured in vacuum of between 0.5 μm and 20 cm.

~~Claim~~ 72_. (Currently amended)[[:]] A The process according to claim 42, wherein the cross-linking is activated by exposing the

extruded polymer to electromagnetic waves with a wavelength measured in vacuum of between 0.8 μm and 10 cm.

~~Claim~~ 73_. (Currently amended)[[:]] A The process according to claim 42, wherein the cross-linking is activated by exposing the extruded polymer to electromagnetic waves with a wavelength measured in vacuum of between 2.0 μm and 1000 μm .

~~Claim~~ 74_. (Currently amended)[[:]] A The process according to claim 71_, wherein the cross-linking is activated by application of infrared radiation.

~~Claim~~ 75_. (Currently amended)[[:]] A The process according to claim 74_, wherein the infrared radiation ~~comprising~~ includes wavelengths in the range 0.5-10 μm .

~~Claim~~ 76_. (Currently amended)[[:]] A The process according to claim 74_, wherein at least 50% of the energy applied by infrared radiation is applied in the form of infrared radiation with wavelengths in the range 0.5-10 μm .

~~Claim~~ 77_. (Currently amended)[[:]] A The process according to claim 74_, wherein at least 50% of the energy applied by infrared

radiation is applied in the form of infrared radiation with wavelengths in the range 1.0-5.0 μm .

~~Claim~~ 78_. (Currently amended)[[:]] A The process according to claim 71_, wherein the cross-linking is activated by application of infrared radiation, the infrared radiation ~~comprising~~ including wavelengths corresponding to the absorption peaks for the polymer material.

~~Claim~~ 79_. (Currently amended)[[:]] A The process according to claim 78_, wherein the maximum intensity of the infrared radiation is in the range 0.5-10 μm .

~~Claim~~ 80_. (Currently amended)[[:]] A The process according to claim 78_, wherein the maximum intensity of the infrared radiation is in the range 1.0-7.0 μm .

~~Claim~~ 81_. (Currently amended)[[:]] A The process according to claim 78_, wherein the maximum intensity of the infrared radiation is in the range 3.0-7.0 μm .

~~Claim~~ 82_. (Currently amended)[[:]] A The process according to claim 42, wherein the pressure in the cross-linking zone is raised to avoid formation of bubbles and irregularities.

~~Claim~~ 83_. (Currently amended)[[:]] A The process according to claim 81, wherein the pressure in the cross-linking zone is raised above 2 bars.

~~Claim~~ 84_. (Currently amended)[[:]] A The process according to claim 42, wherein the extruded material is exposed to the treatment with electromagnetic waves in said cross-linking zone for up to about 600 seconds.

~~Claim~~ 85_. (Currently amended)[[:]] A The process according to claim 42, wherein the extruded material is exposed to the treatment with electromagnetic waves in said cross-linking zone for 5 to 120 seconds.

~~Claim~~ 86_. (Currently amended)[[:]] A The process according to claim 42, wherein the extruded polymer material is subjected to a treatment with infrared radiation in said cross-linking zone, the temperature of the polymer material being raised to above 145°C.

~~Claim~~ 87_. (Currently amended)[[:]] A The process according to claim 42, wherein the extruded polymer material is subjected to a treatment with infrared radiation in said cross-linking zone, the

temperature of the polymer material being raised to between 150 and 200°C.

~~Claim~~ 88_. (Currently amended)[[:]] A The process according to claim 42, wherein the degree of cross-linking obtained is 75% to 90%.

~~Claim~~ 89_. (Currently amended)[[:]] A The process according to claim 42, wherein the degree of cross-linking obtained is 80% to 85%.

~~Claim~~ 90_. (Currently amended)[[:]] A The process according to claim 42, wherein the extruded polymer material enters the cross-linking zone immediately after extrusion.

~~Claim~~ 91_. (Currently amended)[[:]] A The process according to claim 42, wherein the extruded polymer material enters the cross-linking zone no later than 2 minutes after extrusion.

~~Claim~~ 92_. (Currently amended)[[:]] A The process according to claim 42, wherein the extruded and cross-linked polymer material is cooled to ambient temperatures.

~~Claim~~ 93_ (Currently amended)[[:]] A The process according to claim 42, wherein said polymer material ~~being~~ is shaped by extrusion onto a supporting unit in the extrusion station, and wherein the supporting unit is a metallic material.

~~Claim~~ 94_ (Currently amended)[[:]] A The process according to claim 93, wherein the supporting unit is in the form of a reinforcing layer of the flexible unbonded offshore pipe, ~~which~~ said metallic material ~~reflects~~ reflecting at least part of the electromagnetic waves applied in the cross-linking zone.

Claim 95 (Withdrawn): A process according to claim 42, wherein the supporting unit is an armour layer of the flexible unbonded offshore pipe, said armour layer comprising a secondary layer in the form of a tape applied onto the armour, the polymer composition being extruded onto said tape.

Claim 96 (Withdrawn): A process according to claim 42, wherein the supporting unit is an armour layer of the flexible unbonded offshore pipe, said armour layer comprising a secondary layer in the form of a gas permeation barrier applied onto the armour, the polymer composition being extruded onto said tape.

Claim 97 (Withdrawn): A process according to claim 96, wherein said gas permeation barrier is impermeable to liquid and gas.

Claim 98 (Withdrawn): A process according to claim 95, wherein said secondary layer has a reflective surface reflecting the electromagnetic waves applied in the cross-linking zone.

Claim 99 (Withdrawn): A process according to claim 98, wherein said reflective surface of the secondary layer being capable of reflecting at least 50% of the not adsorbed electromagnetic waves.

~~Claim 100.~~ (Currently amended)[[:]] A The process according to claim 42, wherein ~~the~~ a velocity of the extrusion of the polymer material is approximately equal to ~~the~~ a velocity of the extruded polymer passing through the cross-linking zone.

~~Claim 101.~~ (Currently amended)[[:]] A The process according to claim 42, wherein the polymer layer is an inner liner of the offshore pipe[[:]] ~~said inner liner preferably having a thickness of 4 mm or more.~~

~~Claim 102.~~ (Currently amended)[[:]] A The process according to claim 42, wherein the polymer layer is an inner liner of the offshore pipe, said inner liner ~~preferably~~ having a thickness of 8 mm or more.

~~Claim~~ 103. (Currently amended)[[:]] A The process according to claim 42, wherein the polymer layer is an inner liner of the offshore pipe, said inner liner ~~preferably~~ having a thickness of 12 mm or more.

~~Claim~~ 104. (Currently amended)[[:]] A The process according to claim 42, wherein the polymer layer is an inner liner of the offshore pipe, said inner liner ~~preferably~~ having a thickness of 16 mm or more.

~~Claim~~ 105. (Currently amended)[[:]] A The process according to claim 42, wherein the polymer layer is an inner liner of the offshore pipe, said inner liner ~~preferably~~ having a thickness of 18 mm or more.

~~Claim~~ 106. (Canceled)[[:]]

~~Claim~~ 107. (Currently amended)[[:]] A method for the production of a flexible unbonded offshore pipe, said method comprising the steps of

- i) providing a carcass
- ii) applying a gas permeation barrier layer onto the carcass,
- iii) applying an inner liner in the form of a polymer layer using the process as defined in claim 42, wherein the

polymer material is applied onto a supporting unit comprising said carcass and said inner liner, and

iv) applying one or more reinforcing layers onto the inner liner.

Claim 108 (Withdrawn): A method for the production of a flexible unbonded offshore pipe, said method comprising the steps of

i) providing an inner liner in the form of a polymer layer using the process as defined in claim 42, wherein the polymer material is applied into a supporting unit,
ii) applying a gas permeation barrier layer onto the inner liner
iii) applying one or more reinforcing layers onto the inner layer.

Claim 109 (Withdrawn): A method according to claim 107, wherein the gas permeation barrier layer is a wound or folded layer of a foil, such as a metal foil, the foil preferably being wound or folded with overlapping edges.

~~Claim 110.~~ (Currently amended)[[:]] A The method according to claim 107, wherein the gas permeation barrier layer is an extruded polymer layer.

~~Claim 111.~~ (Currently amended)[[:]] A The method according to claim ~~73~~ where 107, wherein said gas permeation barrier layer is sufficiently impermeable to gas to prevent a gas such as selected from the group consisting of methane, hydrogen sulphides, and carbon dioxides at a pressure of 5 bars from diffusing through the layer to ~~its other~~ another side thereof with a pressure of 1 bar.

Claim 112 (Withdrawn): A flexible unbonded offshore pipe comprising at least one polymer layer, said polymer layer being obtained using the process as defined in claim 42.

Claim 113 (Withdrawn): A flexible unbonded offshore pipe comprising an inner liner obtained using the process as defined in claim 42.

Claim 114 (Withdrawn): A flexible unbonded offshore pipe comprising an outer cover obtainable using the process as defined in claim 42.

Claim 115 (Withdrawn): A flexible unbonded offshore pipe comprising an intermediate polymer layer obtained using the process as defined in claim 42.

Claim 116 (Withdrawn): A flexible unbonded offshore pipe obtained by the method as defined in claim 42.

~~Claim 117.~~ (Currently amended)[[:]] A The process according to claim 42, wherein the extrusion and cross-linking ~~steps~~ are carried out in an in-line process, including passing the extruded polymer material from the extruder through a cross-linking zone to activate said peroxide to thereby cross-link the polymer material, and wherein said activation is performed by applying electromagnetic waves in the cross-linking zone, ~~and~~ said polymer material being passed from the extruder to the cross-linking zone with less than 25°C average intermediate cooling.